

REMARKS

This application has been reviewed in light of the Office Action dated June 29, 2006. Claims 1-10, 12-29, and 33-48 are pending in the application. By the present amendment, claims 1, 12, 13, 19, 22, 29 and 36 have been amended. Claims 11, 30, 31 and 32 have been cancelled without prejudice. No new matter has been added. The Examiner's reconsideration of the rejection in view of the amendment and the following remarks is respectfully requested.

By the Office Action, claim 36-48 stand rejected under 35 U.S.C. §112, first paragraph as failing to comply with the enablement requirement.

Claims 36-48 find support in the specification and FIGS. at a plurality of locations through the application. The following will provide illustrative instances where support is provided.

For example, at page 9, the Summary provides support for the method claims as set forth in claims 36-48. FIG. 9 shows the structure of a meta-collector. Monolithic entries are stored in spatial and or temporal order. The monolithic entries include a sub-sequence of events associated with a cache address (see list in FIG. 9). When a new spatial context is encountered in a temporal sequence, a new monolithic entity associated with the new spatial context is created and stored (FIG. 9).

For the convenience of the Examiner, claims 36-48 are set forth indicating illustrative page and line numbers where support is provided in parenthesis.

36. A method for processing a temporal sequence of events, wherein the events have spatial context (page 9, page 22, lines 5-10, FIG. 9, FIG. 10 and accompanying text), the method comprising the steps of:

capturing a set of addresses (e.g., <BA, TA>) in temporal order (FIG. 9, page 22, lines 10-12), the addresses including information associated with each address (see, e.g., cache line 911);

storing sub-sequences of temporal addresses which share spatial context as monolithic entities (FIG. 9 and FIG. 10, page 38-39) wherein each monolithic entity is associated with a particular spatial context (FIG. 9, page 22, lines 10-20); and

when a new spatial context is encountered in a temporal sequence, creating a new monolithic entity (FIG. 10, block 826) associated with the new spatial context (FIG. 9, page 25, lines 10-15 and pages 29-31), the new spatial context including a temporal sub-sequence of events now associated with the new spatial context (page 24, lines 1-5; page 25, lines 10-15; page 40, lines 16-20, (block 830 of FIG. 10).

See also page 41, line 15 to page 42 line 4 for an explanation of spatial and temporal contexts. Monolithic entity is explained at page 22.

37. The methods as recited in claim 36, further comprising the step of storing the monolithic entities associated with the spatial contexts in their temporal order of occurrence. (See FIG. 9).

38. The method as recited in claim 36, wherein the monolithic entities include multi-dimensional data. See FIGS. 8 and 9 with <BA, TA>, etc.

39. The method as recited in claim 38 wherein one of the multi-dimensions includes a spatial dimension. Page 45, lines 4-6.

40. The method as recited in claim 38 wherein one of the multi-dimensions includes a temporal dimension. Page 45, lines 3-6.

41. The method as recited in claim 38 wherein one of the multi-dimensions includes metadata. Page 8, lines 9-12 and page 45, lines 3-6.

42. The method as recited in claim 36 wherein the information includes metadata. Page 8, lines 9-12 and page 45, lines 3-6.

43. The method as recited in claim 36, further comprising: storing the monolithic entities at a location determined by spatial context of the monolithic entities. Page 45, lines 3-14.

44. The method as recited in claim 36, further comprising: storing the monolithic entities at a location determined by temporal context of the monolithic entities. Page 45, line 15 to page 46, line 11.

45. The method as recited in claim 36, further comprising: retrieving monolithic entities from storage in accordance with spatial content of the monolithic entities. Page 45, lines 3-20.

46. The method as recited in claim 45, further comprising: using metadata associated with the monolithic entities by a processor after the monolithic entities are retrieved (see e.g., FIG. 7).

47. The method as recited in claim 36, further comprising: retrieving monolithic entities from storage in accordance with temporal content of the said monolithic entities. Page 45, lines 3-20.

48. The method as recited in claim 47, further comprising: using metadata associated with the monolithic entities by a processor after the monolithic entities are retrieved.
Page 45, lines 3-20.

Upon review of the specification and claims, support for claims 36-48 is present throughout the specification and FIGS. It is respectfully submitted that the claims describe the subject matter in a way that one skilled in the art would understand and would be enabled to make and/or use the invention. Claims 36-48 are believed to be in condition for allowance for at least the reasons stated.

The Examiner is invited to contact the undersigned should additional clarification be needed. Reconsideration is respectfully requested.

By the Office Action, claim 1 stands rejected under 35 U.S.C. §102 (b) as being anticipated by JP 03063726 to Morisada (hereinafter Morisada).

Morisada is directed to branch prediction performance, and includes two branch history tables. The branch instructions appear to be preloaded into the two different tables. There are first and second detecting means respectively associated with the first and second tables. If the first detecting means includes the instruction, the instruction is fetched from the first table or if the second detecting means includes the instruction, the instruction is fetched from the second table. There is no disclosure or suggestion of a meta-collector as described in amended claim 1.

Claim 1, now recites, inter alia, a meta-collector configured to collect look ahead context information in the meta-information which includes at least one of spatial and temporal state information associated with a memory location, such that the meta-collector provides prefetching of history table entries to the first meta-structure based upon the look ahead context information.

Morisada fails to disclose or suggest at least this limitation. Claim 1 is therefore believed to be allowable over Morisada for at least the reasons stated. Reconsideration of the rejection is respectfully requested.

By the Office Action, claims 1-7, 11-16, 21-26, 30 and 33-34 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,679,141 to Pomerene et al. (hereinafter Pomerene).

Pomerene discloses a branch predictor that is divided into two parts: a fast active area that is relatively small in size but can be searched in one cycle, and a large backup area that requires many cycles to search. Pomerene does not disclose or suggest prefetching blocks of historic entries from the large backup area to the active area ahead of the entries use in the way described in the present claims.

In accordance with aspects of the present invention, prefetching is described that anticipates which branch entries in a second level branch prediction table will be used in the near future (based on spatial and temporal context) and transfers these entries to the first meta-structure ahead of their use.

Claim 1, now recites, *inter alia*, a meta-collector configured to collect look ahead context information in the meta-information which includes at least one of spatial and temporal state information associated with a memory location, such that the meta-collector provides prefetching of history table entries to the first meta-structure based upon the look ahead context information.

"Look Ahead Context" is a fixed sized snapshot of the spatially and temporally sequential Meta-information that is likely to be used in the near future, and is employed to determine in advance what events (e.g., instructions) will be needed before they are needed. As mentioned, Pomerene fails to disclose or suggest a meta-collector configured to collect look ahead context information ... which includes at least one of spatial and temporal state information associated with a memory location, and further fails to suggest that the meta-collector provides prefetching of history table entries to the first meta-structure based upon the look ahead context information.

The Examiner stated that the self-loading controls, analyzer and stager of FIG. 19 in Pomerene disclose the meta-collector. The Applicant disagrees. The self-loading controls, analyzer and stager load data into the active area only if space is available and not based on spatial or temporal context of the metadata. See col. 16, line 39 to col. 17, line 5. In addition, prefetching of history table entries to the first meta-structure based upon the look ahead context information is not disclosed or suggested by Pomerene.

The analyzer and stager of Pomerene are employed to assist in carrying out the management of the entries and perform segment entry/exit in accordance with a table (FIG. 21). However, there is no disclosure or suggestion for at least: prefetching of history table entries to the first meta-structure based upon the look ahead context information. Look ahead context information is not disclosed or suggested for determining the next instructions to be prefetched. Therefore, neither a meta-collector nor its function are disclosed or suggested by Pomerene.

Similar arguments can be made with regards to claim 13. Pomerene fails to disclose or suggest a meta-collector configured to collect temporally and spatially sequentially unique meta-information entries each corresponding to a cache line to enable the hierarchical meta-structure operation to provide prefetching of the meta-information entries to a fastest meta-structure level based upon look ahead context information, as set forth in claim 13.

With regards to claim 22, claim 22 has been amended to include the subject matter of claims 30, 31 and 32. Claims 31 and 32 were deemed to be allowable by the Examiner if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

Since Pomerene fails to disclose the previously described aspects of the present

invention, claims 1-35 are believed to be in condition for allowance for at least the reasons stated.

By the Office Action, claims 1-3 and 6-10 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 7,024,545 to Zuraski et al. (hereinafter Zuraski).

Zuraski provides a simple fetch scheme for branch instructions. Zuraski includes first and second level caches for storing branch prediction instructions. When an instruction is evicted from the first level cache it is dropped down into the second level cache. The second level cache only stores a portion or subset to the original information to save space. If the instruction is needed later it is reconstructed from the subset of the original information.

Zuraski fails to disclose or suggest, *inter alia*, a meta-collector configured to collect look ahead context information in the meta-information which includes at least one of spatial and temporal state information associated with a memory location, such that the meta-collector provides prefetching of history table entries to the first meta-structure based upon the look ahead context information. Claim 1 and therefore claims 2-6 and 6-10 are believed to be allowable over Zuraski for at least the reasons stated. Reconsideration is respectfully requested.

By the Office Action, claims 8-10, 17-20 and 28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pomerene in view of Zuraski. Further, by the office action, claim 29 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Pomerene.

The present claims 1, 13 and 22 are believed to be in condition for allowance over Pomerene and/or Zuraski for at least the reasons stated above. Claims 8-10, 17-20 and 28-29 are also believed to be in condition for allowance due at least to their dependency from

claims 1, 13 and 22. Reconsideration of the rejection is respectfully requested.

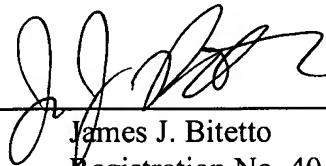
The Applicant notes with appreciation the allowability of claims 27, 31-31 and 35 if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and the allowability of claims 36-48 if rewritten or amended to overcome the 35 USC §112, first paragraph rejection. However, in view of the foregoing amendments and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

It is believed that no additional fees or charges are currently due. However, in the event that any additional fees or charges are required at this time in connection with the application, they may be charged to applicant's IBM Deposit Account No. 50-0510.

Respectfully submitted,

Date: 9/29/06

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